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ABSTRACT

To determine the most accurate means of estimating the expected grade or reading level of 61 sixth grade students, three expectancy formulas were compared to a custom regression equation from a user friendly microcomputer program. The expectancy formulas, based in part on student I.Q. and chronological age, and the regression equations were compared with students' actual achievement level as measured by the California Achievement Test. Results indicated that the regression equation had twice the predictive power of the generalized expectancy formulas and could easily be developed by teachers for their own classes. (MM)

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Reading Expectancy and Regression Formulas

by

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Three expectancy formulas were compared to a custom regression equation from a friendly microcomputer program with 61 sixth grade students. Results indicated that the regression equation had twice the predictive power of the generalized expectancy formulas, and could easily be developed by teachers for their own classes.

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Several grade or reading level expectancy formulas have been used since the first ones appeared in the 1930's. The most common formulas used to predict expectancy were Horn, Harris, and Bond and Tinker. These "rule-of-thumb" expectancy models, which are generalized regression equations, were developed to give teachers a rough estimate of expected grade or reading level as most teachers were unfamiliar with more sophisticated prediction techniques. But how accurate were these prediction formulas?

The performance of the three expectancy formulas (Horn, Harris, and Bond and Tinker) as well as a custom regression equation were compared with the actual achievement level as measured by the California Achievement Test. All of the expectancy formulas utilized the students' chronological age and I.Q. These two factors, along with constants, or converted to measures such as mental age, were combined to produce the expectancy level formulas. The Short Form Test of Academic Aptitude was utilized as the I.Q. level.

The table showed the correlation between actual achievement and predicted achievement as measured by the three formulas and the regression equation designed for these students. The study utilized two, sixth grade classes with a combined total of 61 students.

Correlation Between Predicted and Actual Achievement

	Correlation	R^2	Residual
Horn	.54	.29	.71
Harris	.54	.29	.71
Bond & Tinker	.46	.21	.79
Custom Formula	.76	.58	.42

$p<.01$ for all correlations

Correlation ratios are not directly comparable, but R^2 (coefficient of detrmination) may be used for comparative purposes. The results in the table showed that the regression equation's R^2 was .58 and it was twice as powerful as either the Horn or Harris with an R^2 of .29, and more than twice that of Bond and Tinker whose R^2 was .21. The residual consisted of aspects of achievement which could not be explained. For instance, the Horn formula had an R^2 of .29 which left a residual of .71 which was interpreted to mean that the Horn formula accounted for 29% of the variance in achievement, but could not explain the remaining 71% of whatever it was that comprised achievement. Even the custom regression formula could not account for 42% of achievement.

The custom formula or regression equation was developed on a micro-computer which utilized a "user friendly" program for regression. The formula developed for the class was: $Y' = -1.9-.099(Age)+.096(I.Q.)$ This meant the predicted achievement score (for these classes only) was equal to a constant (intercept) of -1.9 minus .099 times the chronological age, plus .096 times the I.Q. For instance, a student with an age of 10.9 years and an I.Q. of 113 would have a predicted achievement score of [-19-.099(10.9)+.096(113)] which worked out to be 7.9. The actual achievement from the test score was 8.0. The formula also yielded a standard error of estimate which in this case was ± .2 which meant the predicted score would be 7.9±.2 or range from 7.7 to 8.1. In another case, the age was 10.4 and the I.Q. was 100 which gave a predicted achievement of 6.8 and the actual achievement was 6.5. In the third case, the age was 10.8 and the I.Q. was 92 which yielded a predicted achievement of 5.8 while the actual achievement was 7.0 which illustrated that error was present even in the regression equation which developed more complete information than the other expectancy formulas.

Academic skills or lack of them are the result of a much larger set of crucial and complex factors than a score on a test or two utilized in this study. However, we want to assume a meaningful connection between our measuring instruments and methods and some basic reality, and would like to uphold that assumption through what amounts to our best judgement which should be supported by the best methods available to us.

It is relatively simple with "friendly" microcomputer programs to develop a regression equation which will more accurately predict class performance than "rule-of-thumb" formulas. There is no need for in-depth statistical knowledge, but there is a real need, in this day of professional educators, for an understanding and utilization of the best means at our disposal to improve the education of students.

References

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